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STICKERS FOR DERRIS ON CABBAGE AND BEANS

By Robert A. Fulton, Division of Truck Crop and Garden Insect Investigations

Derris has been found effective as a control for numerous insects, and its natural adherence to plant foliage has appeared worthy of investigation. Wind, rain, and light probably account for some of the loss in toxicity on the plant, but the physical properties of the leaf are such that a fair percentage is retained on beans and cabbage.

A sticker for derris to be used against truck-crop insects, where small acreages are being treated, must be easily emulsified and must not interfere with moving parts of the sprayer. A previous study1/ indicated that a rosin-residue emulsion when used with derris was very effective for this purpose. When this combination was used in small hand sprayers, it was necessary to clean the moving parts after each application. The sticker herein described has been used with entire satisfaction in power and hand sprayers without injuring the moving parts.

For testing, in each instance a glass plate was covered with a uniform layer of each mixture by means of a compressed-air atomizer paint sprayer. A fixed position was maintained for the atomizer and the plates were moved four times around the target for the complete application. The plates were allowed to dry at room temperature, 78° to 80° F., for 4 hours and then reweighed. The plates were then exposed to what may be termed "artificial rainfall" by the use of a coarse spray. This spray was applied at the rate of one-eighth inch of tap water per minute, and the plates were exposed for 16 to 17 minutes. This type of exposure was adopted because the conditions may be duplicated and a comparison made of the efficiency of the stickers in the laboratory. The exposed plates were then dried at room temperature, and the loss in weight determined. The average loss of rotenone was determined by using the colorimetric method of Gross and Smith2/. A more sensitive test3/ for

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1/ Goodhue, L. D., and Fleming, W. E. Stickers for Derris Applied as an Insecticidal Spray. Jour. Econ. Ent. 29 (3): 580-583, June 1936.

2/ Gross, C. R., and Smith, C. M. Colorimetric Method for Determination of Rotenone. Jour. Assoc. Off. Agr. Chemists 17: 336-339, May 1934.

3/ Goodhue, L. D. An Improvement on the Gross and Smith Colorimetric Method for the Determination of Rotenone and Deguelin. Jour. Assoc. Off. Agr. Chemists 19: 118-120, Feb. 1936.

rotenone and deguelin was reported after this investigation was completed. A later comparison of the two methods showed parallel results throughout.

The type of emulsifying agent is very important in the selection of the satisfactory sticker. Triethanolamine and different soaps were found to prevent the hardening of the varnishes and they also lowered their efficiency as stickers. Sodium alkyl sulphates with a low iodine number were found to be most effective as emulsifying agents and were used at the rate of 0.9 dram (3.5 grams) to 2½ gallons of water. Preliminary tests with the different types of stickers showed that the amount of the adhesive material used for the suspension of derris in water did not change its effectiveness. For the tests reported herein the sticker was used at the rate of one-fourth the weight of derris containing 5.0 percent of rotenone. The results are presented in table 1.

Table 1.--Retention of derris spray and stickers on glass plates.

Material tested	Percent of weight of spray and sticker retained on plate	Percent of rotenone recovered by colorimetric analysis
1. Derris and varnish (slow-drying type)	95	94
2. Derris and varnish (fast-drying type)	95	93
3. Derris and agar-agar	75	70
4. Derris and malt syrup	60	55
5. Derris and casein	50	50
6. Derris and Karo	45	40
7. Derris and glucose	25	20
8. Derris and animal glue	2	1
9. Derris	9	10

The two different types of varnish appear to be the most effective stickers for derris on glass plates. Type A is made by digesting turpentine with natural resins and may be considered a slow-drying varnish. Type B is made from tung oil and synthetic resins. Agar-agar appears to be efficient as a sticker, but the initial cost would prohibit consideration, and the fermentation of malt syrup before and after the application makes this material undesirable.

As a result of the effectiveness of varnish on glass plates, the varnish mixtures were tried under field conditions on beans and cabbage.

In preparing the emulsion for the application, the sodium alkyl sulphate [0.9 dram (3.5 grams) to 2½ gallons of water] was first added to a small amount of water and stirred until dissolved with a mechanical mixer. The varnish (one-fourth the weight of derris powder) was then slowly added to the solution with constant stirring. The derris was then added to the mixture and stirred until a uniform suspension was obtained. The mixture was then diluted to a known volume (2½ gallons) and applied with the compressed-air sprayer.

Individual samples of seed leaves of bean plants were analyzed following the application to obtain an average value for the initial application deposit. Seed leaves were removed at intervals and the loss in derris noted. The derris was removed from the leaves by cold extraction with chloroform. The chloroform was removed by evaporation and the residue digested with acetone, and aliquots were then used for the colorimetric analysis.

At the time of this test no rain fell and all moisture was applied to the foliage by means of a sprinkler. A rain gauge was used in each plot and an equal quantity of moisture was added (2 inches).

Both of the varnish mixtures on beans retained 75 percent of the original suspension, while the derris-water suspension retained 50 percent. On cabbage the varnish mixture retained 80 percent of the original deposit, while the suspension of derris in water retained only 30 percent. The two types of varnish appear to be very efficient on beans and cabbage. There was no visible injury to the plants treated with the derris-varnish mixtures.

The protective coating produced by the varnish-alkyl sulphate emulsion, when diluted with water, is of interest. If a glass plate is dipped in or sprayed with the solution, a white, sticky film is obtained, resembling an egg membrane. This film may also be detected on the leaf surface.

The varnish stickers have been used with a derris in water suspension with a rotenone content of 0.005, 0.01, and 0.25 percent, respectively.

Field tests as to the effectiveness of the sticker on beans, cabbage, and peas have been made during the past two seasons, and the observations of these tests will be reported elsewhere. No visible injury to plants treated with the two types of varnish has been reported.